

Claims

1. A security document, in particular paper of value such as bank note, or semifinished product for producing the security document, comprising a substrate (1) with first and second opposing substrate surfaces and a multilayer security element (2, 4) that is so connected with the substrate (1) that it is visually recognizable at least from one of the two substrate surfaces, characterized in that
  - the security element includes an interference element (*I*) producing a color shift effect and a layer (*S*) with diffraction structures (8) that at least partly overlaps the interference element (*I*), or
  - the security element includes a multilayer interference element (*I*) producing a color shift effect and having gaps in at least one layer.
2. A security document or semifinished product according to claim 1, wherein the security element is semitransparent.
3. A security document or semifinished product according to claim 1 or 2, wherein the security element (2, 4) is applied to one of the two substrate surfaces and spans a hole (3) or a transparent area in the substrate (1).
4. A security document or semifinished product according to claim 1 or 2, wherein the security element (4) is at least partly embedded in the substrate (1) and spans a hole (3) or a transparent area in the substrate (1).
5. A security document or semifinished product according to claim 4, wherein the security element (4) is so embedded in the substrate (1) that it is visually recognizable in first areas (7) of the substrate (1) on the first substrate surface and optionally additionally in the second areas of the substrate different from the first areas on the second substrate surface.
6. A security document or semifinished product according to claim 4 or 5, wherein the security element (4) is a security thread.

7. A security document or semifinished product according to at least one of claims 1 to 6, wherein the interference element ( $I$ ) is present on a transparent plastic substrate ( $S$ ).
8. A security document or semifinished product according to claim 7, wherein the plastic substrate ( $S$ ) is colored.
9. A security document or semifinished product according to at least one of claims 1 to 8, wherein the interference element ( $I$ ) includes a first absorber layer ( $A_1$ ), a dielectric layer ( $D$ ) adjoining and overlying the first absorber layer ( $A_1$ ) and a second absorber layer ( $A_2$ ) adjoining and overlying the dielectric layer ( $D$ ).
10. A security document or semifinished product according to at least one of claims 1 to 8, wherein the interference element ( $I$ ) includes at least three adjacent, mutually overlying dielectric layers ( $D_1$  to  $D_4$ ) having alternately a high and a low refractive index.
11. A security document or semifinished product according to at least one of claims 1 to 10, wherein the layers ( $A_1$ ,  $D$ ,  $A_2$ ;  $D_1$  to  $D_4$ ) constituting the interference element ( $I$ ) are vapor-deposited.
12. A security document or semifinished product according to at least one of claims 1 to 11, wherein the interference element ( $I$ ) has gaps (9) in the form of signs, patterns or encodings, the gaps preferably being present only in one of the layers of the interference element, especially preferably in at least one of the absorber layers.
13. A security document or semifinished product according to at least one of claims 7 to 12, wherein the plastic substrate ( $S$ ) has the diffraction structures (8).
14. A security document or semifinished product according to at least one of claims 1 to 12, wherein the diffraction structures (8) are present in a separate layer.
15. A security document or semifinished product according to at least one of claims 1 to 14, wherein the diffraction structures (8) include an embossed relief pattern.

16. A security document or semifinished product according to at least one of claims 1 to 15, wherein the diffraction structures (8) directly adjoin the interference element (*I*).
17. A security document or semifinished product according to at least one of claims 1 to 16, wherein an effect caused by the diffraction structures is visually recognizable from one or both sides of the security element depending on the way of viewing the security element.
18. A security document or semifinished product according to at least one of claims 1 to 17, wherein an effect caused by the diffraction structures and/or a color shift effect produced by the interference element is visually recognizable from both sides of the security element depending on the way of viewing the security element.
19. A security document or semifinished product according to claim 18, wherein the effect caused by the diffraction structures and/or the color shift effect produced by the interference element are of identical design from both sides of the security element depending on the way of viewing the security element.
20. A security element to be embedded in or applied to a security document (1), in particular for a paper of value such as a bank note, characterized in that
  - the security element includes an interference element (*I*) producing a color shift effect and a layer (*S*) with diffraction structures (8) that at least partly overlaps the interference element (*I*), or
  - the security element includes a multilayer interference element (*I*) producing a color shift effect and having gaps in at least one layer.
21. A security element according to claim 20, wherein the interference element (*I*) is present on a transparent plastic substrate (*S*).
22. A security element according to claim 20 or 21, wherein the interference element (*I*) includes a first absorber layer (*A*<sub>1</sub>), a dielectric layer (*D*) adjoining and overly-

overlying the first absorber layer ( $A_1$ ) and a second absorber layer ( $A_2$ ) adjoining and overlying the dielectric layer ( $D$ ).

23. A security element according to claim 20 or 21, wherein the interference layer ( $I$ ) includes at least three adjacent, mutually overlying dielectric layers ( $D_1$  to  $D_4$ ) having alternately a high and a low refractive index.
24. A security element according to at least one of claims 21 to 23, wherein the layers ( $A_1$ ,  $D$ ,  $A_2$ ;  $D_1$  to  $D_4$ ) constituting the interference element ( $I$ ) are vapor-deposited.
25. A security element according to at least one of claims 20 to 24, wherein the interference element ( $I$ ) has gaps (9) in the form of signs, patterns or encodings, the gaps preferably being present only in one of the layers of the interference element, especially preferably in at least one of the absorber layers.
26. A security element according to at least one of claims 21 to 25, wherein the plastic substrate ( $S$ ) has the diffraction structures (8).
27. A security element according to at least one of claims 20 to 25, wherein the diffraction structures (8) are present in a separate layer.
28. A security element according to at least one of claims 20 to 27, wherein the diffraction structures (8) include an embossed relief pattern.
29. A security element according to at least one of claims 20 to 28, wherein the diffraction structures (8) directly adjoin the interference element ( $I$ ).
30. A security element according to at least one of claims 20 to 29, wherein an effect caused by the diffraction structures and/or a color shift effect produced by the overlying interference element are visually recognizable from both sides of the security element depending on the way of viewing the security element.
31. A security element according to at least one of claims 20 to 30 in the form of a security thread to be embedded in a security document.

32. A security element according to at least one of claims 20 to 30 as a label or patch to be applied to a security document.
33. A security element according to at least one of claims 20 to 30 and 32 as a transfer element to be applied to a security document by the transfer method.
34. Transfer material for applying a security element to a document of value, characterized in that the transfer material includes the following layer structure:
  - an interference element (*I*) with a color shift effect, and
  - a layer with diffraction structures.
35. A method for producing a transfer element for applying a security element to a document of value, characterized by the following steps:
  - a) incorporating diffraction structures in a layer (*S*), and
  - b) vapor-depositing an interference element.
36. A method for producing a document of value having a security element, characterized in that the layer structure of the transfer material according to claim 34 is transferred to the document of value in certain areas.
37. Use of the transfer material according to claim 34 for producing security elements.
38. Use of the security document or semifinished product according to at least one of claims 1 to 19 for protecting products.